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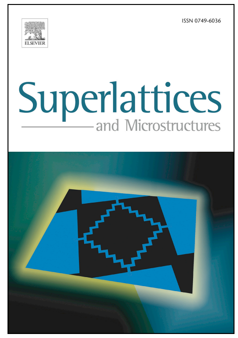

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On the properties of non-Bragg gaps of one-dimensional metamaterial superlattices

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Abstract

We present a theoretical study of the nature of photonic band gaps of one-dimensional photonic crystals containing dispersive materials. Within the transfer-matrix formalism, we calculate the photonic band structure, transmission spectra and electric field profile for multilayered structures constituted by the periodic repetition of polaritonic and left-handed layers. It is suggested that the prediction of the existence of the $\langle n \rangle = 0$, plasmon-polariton, and ϕ_{eff} non-Bragg gaps, according to the frequency dependence of the permittivity and permeability of both layers, may be made simpler through the definition of more convenient quantities such as the generalized impedance and optical path length.

Keywords: non-Bragg gaps, photonic crystals
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1. Introduction

In the last three decades or so much, effort has been dedicated to the development of photonic crystals and optical structures with periodically modulated refractive indexes [1, 2, 3]. Periodic boundary conditions imposed by the dielectric media in such systems indicate the possibility of light manipulation by photonic band gap (PBG) engineering. Recent advances of spatial filtering of laser beams in photonic crystals propagating in different regimes